**Before the**
**Federal Communications Commission**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
| | ) | |
| Technical Standards for Determining Eligibility | ) | |
| For Satellite-Delivered Network Signals Pursuant | ) | ET Docket No. 05-182 |
| To the Satellite Home Viewer Extension and Reauthorization Act | ) | |

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Response by:

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Viamorph, Inc. submits these comments in reply to the Notice of Inquiry ET Docket No. 05-182, In the Matter of Technical Standards for Determining Eligibility For Satellite-Delivered Network Signals Pursuant To the Satellite Home Viewer Extension and Reauthorization Act.

## About Viamorph

Viamorph Inc. is a manufacturer and licensor of antenna technologies with applications in digital television. Viamorph is introducing to the consumer marketplace a new class of antennas that automatically adjusts their electrical shapes in response to changes in environment and signal conditions so as to maintain optimal performance at all times. This new technology, which we call DiSA™ (Digital Smart Antenna), is embodied in an antenna that can change virtually all of its electrical characteristics including gain, pattern and beamwidth. DiSA™ antennas operate in conjunction with receiver resident software which performs the signal analysis and controls the antenna configuration.

## Introductory Comments

In order to assess the DTV experience from the consumer viewpoint, Viamorph conducted an extensive review of the comments available at numerous internet fora such as www.avsforum.com and product reviews at sites like www.circuitcity.com. As it is rare for reviewers to state all the particulars of their equipment and location etc., our methodology was necessarily simple - we assigned comments and reviews into broad subjective categories. Nonetheless, we believe that those sources are a wealth of valuable qualitative information regarding the DTV experience. In addition, we distributed a more structured questionnaire via a few of the fora. Our comments are based in part on the conclusions derived from all of those activities.

Some results of our research:

- For any particular antenna, customer reviews ran the gamut from very negative to very positive. A negative review is one in which the reviewer makes an explicit recommendation against the product and/or reports less than complete ability to receive all the local stations. While reviewers rarely indicated whether they were in urban, suburban or exurban environments we note that many reviewers indicated an ability to receive all the analog signals available to them but not all the digital signals.
- Many reviewers reported complete satisfaction with their antennas, stating they were able to receive all the available digital signals with minimum effort.
- Reviewers frequently report the need to make nearly continuous adjustments to their antennas, especially (but not only) when changing channels.
- Many reviewers have tried at least two antennas, some going through three or more, and still had varying degrees of success.
- Conflicting reviews were prevalent. For every antenna recommendation other reviewers reported that it didn't work for them.

We are also pleased to provide the Commission with comments due to a study conducted by Viamorph's Vice-President of Research and Development, John Ross, Ph.D., PE. Dr. Ross is an expert in applied electromagnetics and specializes in computer analysis, and design of vehicular antennas, wideband, and re-configurable antennas. While Dr. Ross was able, eventually, to receive *most* of the available DTV channels in Salt Lake City, Utah, it is clear that the level of expertise and effort required to do so is beyond the vast majority of consumers.

We also recommend Dr. O. Bendov's 1999 paper "On the Validity of the Longley-Rice (50,90/10) Propagation Model For HDTV Coverage and Interference Analysis" which documents the numerous shortcomings of the ILLR and the 50/90/10 methods. The paper is available at http://www.dielectric.com/broadcast/longley-rice.asp. His conclusion: "Analysis of the available field test results coupled with key theoretical considerations shows that a modification of the LR model will be required before it could be effectively used for HDTV coverage and interference prediction." The consumer experience has shown that this conclusion may be an understatement.

Among our conclusions based on the above, we believe that any predictive model must include methods to account for the wide and frequently unpredictable performance of the antennas available to consumers.

Comments to the specific items of the Notice

The Commission states in item 6 of the Notice, "*These criteria presume that households will exert similar efforts to receive DTV broadcast stations as they have always been expected to exert to receive NTSC analog TV signals.*" Our research indicates the level of effort (and not incidentally, expense) required for consumers to receive DTV signals OTA is often considerably greater than that required for analog signals. In our comments below we supply considerable justification for this conclusion.

With regard to item 7 of the Notice, Dr. Ross supplies the following comment:

> *This seems to be a significant issue based on my experience here in downtown Salt Lake City. My existing analog television service is very good. These signals are received via a directional outdoor antenna (with rotator). Despite the fact that the system performs very well for analog television, it did not perform well with a DTV receiver. Specifically, I found*

*that the first time I connected the receiver to this antenna system the DTV receiver did not find a single one of the 10 available stations during the channel scan process.*

With regard to item 9 of the Notice , our research indicates that aiming and antenna directivity issues are critical for many, if not most, consumers. Consider this typical comment at www.avsforum.com:

> *Some around here (No Va) can use the wider beam to get Balt and Wash without a rotator. Others will suffer multipath from that. Bite the bullet and call in the pros.*

Respondents to our questionnaire also typically indicated the need to reorient their antenna in order to receive various channels and even then, respondents were frequently unable to receive all the DTV channels in their area.

Consider too, the article by Philip Yam in the June 2005 issue of *Scientific American* magazine, subtitled 'Receiving HDTV over the air takes luck and lots of patience'. The article opens

> *Keep the antenna level. Rotate it 90 degrees. Move it a few inches to the left. Stand to the right. Hold it a bit higher & there--nope. Try again.*

We conclude that a fixed antenna is not a viable DTV antenna solution for many consumers. We further note that aiming is more difficult for DTV than for NTSC. According to the FCC's definitions, the difference in Signal-to-Interference ratio (SIR) between an unusable and a (merely) passable NTSC picture is approximately 20 dB. This allows a consumer to see gradual improvement or reduction in picture quality as he makes antenna adjustments, and makes it easy for him to optimize antenna orientation. In ATSC, the difference in SIR between an unusable and an excellent picture is less than 5dB, which makes it difficult for the consumer to see the effect of his antenna adjustments. As the consumer adjusts his antenna to receive a signal, he will often see no picture until he happens to orient the antenna in a direction in which the SIR exceeds Threshold of Visibility (TOV), and once this happens he may have no way of maximizing the SIR above TOV. As a result, the antenna may be oriented in a direction where the SIR is marginally above that required for TOV, and any reduction in signal strength due to the motion of people or vehicles, or changes in atmospherics will cause a loss of picture. And, of course, this adjustment procedure must be repeated for ATSC channels received from different directions. Frequently, the aiming operation must occur every time the viewer changes the channel.

With regard to items 10 and 11 of the Notice, we believe that the assumptions regarding the receiving system are unrealistic. We are unaware of any antenna available to consumers to date, at any price, which is optimized on a channel by channel basis as is the test antenna. Additionally, assuming optimal antenna orientation necessarily implies a rotor or other consumer controlled pointing mechanism. We have commented elsewhere that antenna aiming is considerably more important and difficult for DTV than for NTSC. The assumption that a receiving antenna may be optimally oriented is therefore unrealistic.

We also note that the gain of an antenna is additionally dependent on the intended frequency and bandwidth of operation. The Commission is aware that reception of distant signals usually calls for an antenna system with multiple elements, each designed for use at certain frequencies. For example, many, if not most, outdoor antenna installations incorporate separate elements for UHF and VHF reception. While those antennas are designed to provide the best gain performance in the intended *band* of operation, their gain performance at any *particular* frequency is lower than an optimal antenna *for that particular frequency*. The assumption that the receiving antenna is optimally chosen for frequency is therefore also unrealistic.

With regard to item 11 of the notice, Viamorph is introducing to the consumer marketplace a new class of antennas that automatically adjusts their electrical shapes in response to changes in environment and signal conditions so as to maintain optimal performance at all times. This new technology, which we call

DiSA™ (Digital Smart Antenna) is embodied in an antenna that can change virtually all of its electrical characteristics including gain, orientation and pattern as required. DiSA™ antennas operate in conjunction with receiver resident software which performs the signal analysis and controls the antenna configuration. The DiSA™ antenna solves most of the other thorny problems inherent in making a predictive model which must of necessity include consideration of antenna characteristics.

The Commission is aware of the fact that currently available antennas are designed for optimal operation at certain frequencies and bandwidths. An antenna designed for distant reception of low VHF signals will most likely not have sufficient gain to receive distant UHF signals. This fact explains the widespread usage of multiple element antenna systems with, for example, both log-periodic and bow-tie elements. Due to its unique properties, the DiSA™ antenna operates efficiently across a wide frequency band. We are currently using prototype models which demonstrate wide tunable bandwidth. One typical example proved usable from 50 MHz to over 800 MHz. Thus the consumer will need only one DiSA™ antenna regardless of ultimate broadcaster channel elections.

The DiSA™ antenna can be "pointed" to virtually any azimuth entirely by controlling internal switches – the antenna does not physically move. This azimuthal selection can be accomplished in milliseconds. This feature re-enables the viewer to channel surf as he no longer needs to get up to adjust the antenna each time he hits a button on the remote. In essence, the DiSA™ finally brings the convenience of the remote control to OTA DTV. The DiSA™ antenna thus avoids both the added expense of a rotor mechanism and the consumer effort of manual pointing.

The DiSA™ antenna form factor is amenable to indoor or outdoor mounting. The "standard model" today is a flat, rectangular package about 60 cm by 40 cm (approximately 23 inches by 16 inches) on a side and only 10 cm (less than two inches) thick. The DiSA™ antenna technology can be even be non-planar. We ask the Commission to note that indoor mounting necessarily implies lower gain and also entails yet another level of variability due to the various construction materials that might be encountered such as the wire plaster backer used in many older, exurban homes.

Viamorph believes that the term 'performance' should not be limited to strictly technical characteristics but should also include considerations of price, convenience, range of applicability and so on.

## Concluding Comments

We believe that any predictive model must include methods to account for the wide and frequently unpredictable performance of the antennas available to consumers. It is our opinion that an accurate model would have to encompass extremely detailed geographical, botanical, atmospheric and other data. Due to the complexity and the lack of data such an effort seems impracticable. If such a model could be created, we estimate the uncertainty would be on the order of 10 dB or more.

We are convinced that no model which does not account for, in some way, the receiving antenna characteristics, is doomed to make grossly inaccurate predictions. Supposing a model were to be created as in the above paragraph, coupling its uncertainty with the wide range of antenna operation and placement factors produces a model with such a great degree of uncertainty as to be essentially useless.

We are pleased to bring the fact of an entirely new antenna technology to the Commission's awareness. Viamorph will be happy to provide additional information at the Commission's request.

Respectfully submitted,

Peter Bradshaw